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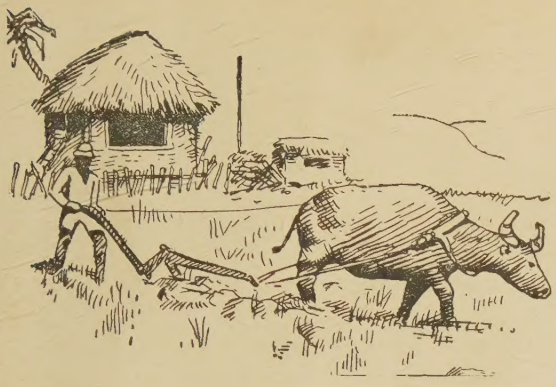

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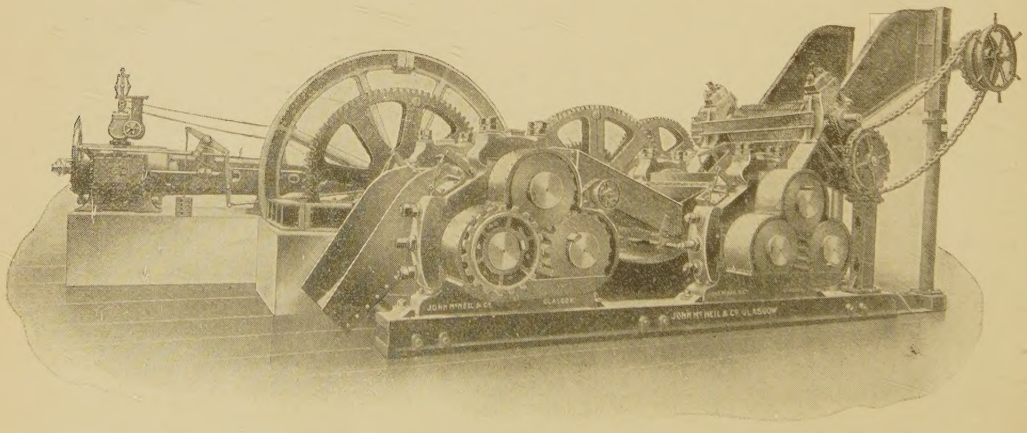

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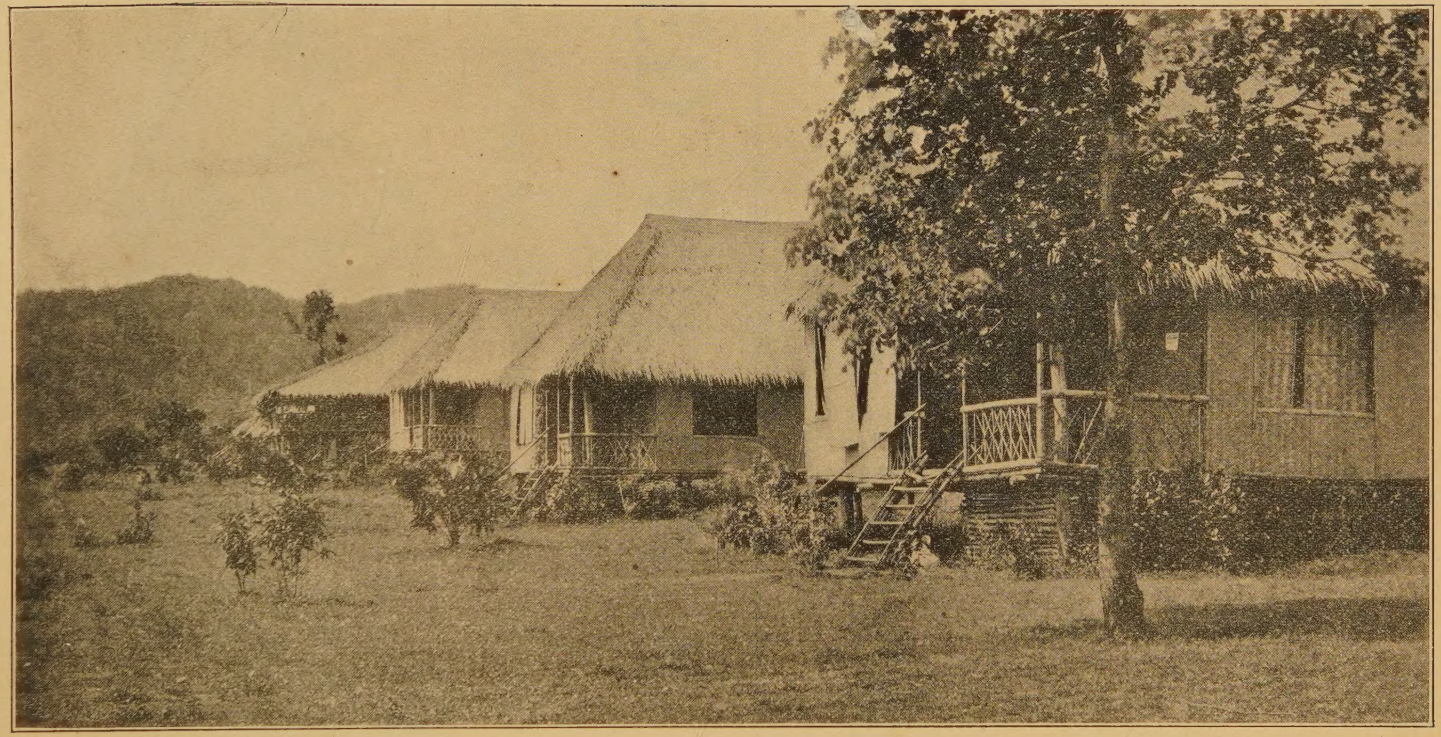

ROW OF STUDENT COTTAGES, FOREST SCHOOL, LOS BAÑOS, LAGUNA

THE PHILIPPINE AGRICULTURIST AND FORESTER

VOL. I. OCTOBER, 1911 No. 8

LOCAL NEWS

Mr. Donald M. Matthews has been promoted from Instructor to Assistant Professor of Forestry.

Mr. Manuel Roxas has been appointed Assistant in Chemistry and Mathematics.

Mr. Mariano Manas has transferred from the College to the Bureau of Agriculture. His place as Foreman and Assistant in Agronomy has been taken by Mr. Inocencio Elayda.

Work on the irrigation system of the college, money for which was made available by the Legislature nearly two years ago, has at last been begun, and is expected to be pushed rapidly to completion.

The students of the College of Agriculture won all of the dual track meets, and the Inter-Collegiate Meet with 87 points to 57 for all of their opponents combined.

Mr. Edgar M. Ledyard, on leave for this college year, is Assistant Curator of the Museum of the University of Michigan. He is expected to return to Los Baños by the end of March.

DEPARTMENT OF CHEMISTRY

An experiment was recently made by Mr. Villegas on the conversion of cassava tubers into alcohol. The sliced material was boiled five hours with 2 per cent sulphuric acid in an open vessel, then the liquid was neutralised with calcium carbonate and fermented with yeast. An amount of alcohol was obtained corresponding to only 3 per cent starch of the cassava taken. The experiment will be repeated when an autoclave arrives which has recently been ordered for the college, using material which has been more finely ground.

Mr. Cevallos has worked out a method for the separation of copper and cadmium which has proved useful in the hands of the class. Mr. Roxas and Mr. Elayda are at work on the chemical properties of the fibres of capok and of cotton. Analyses of food samples and plant ashes are being carried out by other persons.

THE COFFEE INDUSTRY IN THE ISLAND OF LUZON

The following is a report on the coffee industry in Batangas, Cavite, and Benguet.

In Batangas, the municipality of Lipa used to be the most important site for coffee. Its production in the year 1889 was estimated (Philippine Census, 1904) at 100,000 piculs valued at three and one half million pesos. The average yield per cavan of coffee in Lipa was estimated as ten piculs. The total production of 1889, therefore, meant 8,000 hectares of land planted into coffee. But this was only the fruit-bearing area. There was, aside from this, one and one half as much land planted into young trees, which were destroyed by the rust before they could reach the bearing age. This pest became serious in 1890, and within a few years the whole of the Lipa plantation was practically wiped out.

Of these 16,000 to 20,000 hectares of coffee, there only remain 30 to 40 hectares scattered in several barrios. In the barrio of Talisay located east of the

town of Lipa at the foot of Mount Malarayat there is a patch of about 6000 trees, the property of Estefana Malaluan. This patch is kept relatively free from weeds. Anii is used for shade. It is claimed by the people that this is the best shade tree for coffee. At the time of my visit there, last September, the trees were in fruit, but were already showing infection with Hemileia. While this is the only important remnant of the once flourishing plantation in this barrio, yet a great many individual trees are found all over the barrio. Talisay and the neighboring barrios at the foot of Malarayat are naturally relatively more humid, and with richer soil, than any other place in Lipa. This accounts for the fact that while individual trees elsewhere will barely fruit at any time, trees at the foot of Malarayat can yet produce crops in alternate years. The plantation of Sra. Malaluan produced about five piculs of beans last year, while the yield this year was only one picul.

In the barrio of Suluc, next to Talisay on the northward side, there is a patch of about 15,000 trees belonging to Norberto Marave. This is in approximately the same condition as Sra. Malaluan's, but only one half has been cultivated, that is, has been cleared out of brush and weeds. Infection with Hemileia was also appearing in this plantation. Mr. Marave realizes the fact that he can make his trees more productive by cultivating them, but lack of men makes it impossible to take the proper care. His plantation produced in 1909 about twenty piculs of beans, in 1910 about eight, and about twelve this year. The Lipa coffee sells locally at the rate sixty pesos per picul. At this price, Mr. Marave's plantation produces from five hundred to over one thousand pesos per year. There are several small patches of from ten to fifty trees in this barrio, all of them infected with rust.

North of Suluc is the barrio of Lumbang where a few patches of coffee are found but none of them containing more than thirty trees. The total production of coffee in the municipality of Lipa as estimated by the Municipal Treasurer ranges from ten to thirty piculs per year.

The hope of the people in Lipa to raise coffee again some day, when the risk has been reduced to a minimum, as they expect it to be, has not been lost as yet. But this hope will never be realized as long as the people are not taught the preventive measures without which coffee can not be productive under existing conditions. The Bureau of Agriculture in 1903 had planted Coffea robusta, a hybrid of C. arabica and C. liberica on a piece of land just outside of the town. This hybrid was supposed to be more resistant to rust than C. arabica. Previous to planting lime was applied to the soil. No shade tree was used. But after a time the plants were showing infection. They produced some beans once or twice five years after being transplanted, and died afterwards through lack of leaves. The man who was in charge of this experiment appears not to believe at that time in the existence of the rust, but rather thought that *bagumbung* was the active agent in the destruction of the Lipa plantations. *Bagumbung* is a general Tagalog name for insect larvae working and living in roots, stems or branches of plants. Bagumbung did considerable damage to coffee formerly, but its attack did not reach the point of affecting the whole crop. It is beyond doubt that the rust did the business.

In the barrio of Mataas-na-kahoy there are about five hundred trees of Coffea liberica, and an equal number of C. robusta planted together on a single patch. The trees are only about five years old, and are not yet bearing. The C. robusta is showing evident infection with rust, while the Liberian is not attacked at all. This plantation belongs to Sr. Pedro de Silva. There is another patch of about two hundred robusta trees in the same barrio not very far from Sr. Silva's plantation.

There is a plantation of Liberian coffee, on the property of Sr. Genato of Manila, which I did not have a chance to visit. This plantation is about twenty to thirty hectares and is located in S. José, a neighboring town west of Lipa. The crop is of no great commercial value.

It is doubtful whether coffee, if raised now-a-days by people in Lipa, will be as profitable as it used to be in 1899. Labor was formerly very cheap and coffee did not require one fourth as much care as it would if raised under present conditions. It is true that the price has almost doubled, but this increase in the price has not been by any means proportionate to the increase in the cost of labor and maintenance under the adverse conditions of the present days. Coffee can surely be made profitable, if made the subject of intensive cultivation. People in Lipa are not as yet prepared to undertake this system. It is, therefore, safe to conclude that the Lipa planters will never again raise coffee, except when the Government lends its helping hand. There are several reasons for desiring that coffee be raised again in Lipa. The most important one is that being able to produce it better and in the long run cheaper at home, it is a very sad state of affairs to be compelled to import it among other products in large quantities from foreign countries. The Philippines are at present importing over one half million pesos worth of coffee, w en Lipa alone in 1889 produced nearly four million pesos worth of the same product!

The best known remedy for the coffee rust at present is the Bordeaux mixture. Its preparation and use are described in the following extract from reports of trips made in 1905 by Dr. E. B. Copeland to Cavite and Benguet in pursuance of an order of the Director of Education.

COFFEE INDUSTRY IN BENGUET AND LEPANTO BONTOC

"Gov. Pack furnished me the accompanying table, showing the coffee production of the towns of Benguet. In the afternoon, I inspected the young coffee plantation of Mr. Wagner, in Trinidad. He has here about 5000 seedlings, which, so far as I can learn, is the largest single patch of coffee in the vicinity. I was repeatedly told in Baguio that the "blight" or "pest," or "plague" of coffee is wanting in this region; yet all these terms certainly refer to the Hemileia, and I have been unable to find a single tree, except occasional very young seedlings, which is not evidently infected.

"October 24, walked from Baguio to Ambuklao. There is a very little coffee along the trail, none of it very productive, and all infested by Hemileia. The same is true of Ambuklao. At this place the dead branches are usually utilized as ants' nests.

"October 25, walked from Ambuklao to Bokod, and thence to Daklan. In a barrio a mile below Bokod is a very small patch of coffee,—about 30 trees in all, —nearly free of Hemileia, in which I could detect no infection of some of the interior trees. This is probably due to late infection of the isolated patch, and not at all to constitutional immunity. Coffee about Bokod is not very productive, and the valley is regarded as too hot for it. None of the coffee in Benguet is shaded.

"October 26. I inspected some of the Daklan coffee. Daklan is remarkable among the towns of Benguet for having produced a very heavy crop last year. This year it is light; so much so that it is reported in Baguio that there is none of it. The trees are fairly infected with Hemileia. There is also another fungous leaf-parasite present, producing dark-brown spots. In a very careful search I have been unable to find this fungus on any leaf not already badly injured by Hemileia, and therefore conclude that it cannot infect sound leaves. My material of this fungus cannot be identified; which is no great misfortune, since it seems not to be an enemy of healthy trees.

"The township secretary says the attack of Hemileia was less severe last year, which statement does not harmonize with my own observations nor with what other inhabitants of this region report. He also says the branches, but not the roots, are attacked by a worm which is only to be found in the dry season. It would seem that such an animal, if a real enemy, must leave some traces, but we were unable to find any.

"Leaving Daklan, walked to Adouay, and thence to Lutab and Cabayan. About Adouay there is little coffee, perhaps because the climate is too hot and dry. Lutab is an orchard of coffee, very heavily laden this year, but the worst infested with Hemileia I have anywhere seen. Its output is included in the figures given for Cabayan.

"October 27. Spent at Cabayan, the principal coffee-growing community of Benguet. There is a heavy crop this year, which was beginning to be harvested at the time of my visit. I was unable to find a single tree free of Hemileia. Its destructiveness is very variable, dependent probably on the earliness of infection. Considerable parts of some trees are entirely destitute of leaves, and on these the fruit is blasted and the branches are dead. More commonly, the leaves are reduced to 2 to 4 on a branchlet which would normally bear as many as 10; on these the fruit is now maturing prematurely and must certainly be light. Many trees are still less infected, but most of these are not very productive this season. Except where the present scarcity of fruit and lightness of infection are due to too much protection, these trees will probably bear heavily next year; but their leaves will carry over the Hemileia, and they will be the first trees badly infected. In this way, the trees without fruit one year are usually the most prolific the next. On the alternate,—the fruit-bearing,—years they end the season practically leafless; their leaves come late next season and are consequently the least infected. Thus a tree bears crops alternate years.

"The pulpy coat is removed by hand or by mouth. The areas about and near the houses are very fully utilized. Usually, but not always, the land is terraced, the terraces sometimes being broad enough for but a single row of trees. Where even such terracing is impossible an area barely half a meter square is sometimes leveled for a single tree. No ground in Cabayan seems too poor or rocky for productive coffee. Because the trees live, and produce crops at times, they are regarded as healthy; practical sterility in alternate years is said to be "costumbre del café". The secretary, the only inhabitant with whom I could talk, was very sceptical as to the local coffee's having any disease whatever. Under such circumstances it will be exceedingly difficult to introduce the use of any measures of combating or restricting the rust.

"Oct. 28, walked through Buguias to Loo. At Buguias there is a little coffee, fairly well laden, and all rusty. At Loo there is almost no coffee, and the few trees are in poor condition. I understand from Mr. Loher that there was considerable here in 1897, badly infected by Hemileia.

"October 29, Sunday, climbed Mt. Data, returning to Loo.

"October 30, walked to Cervantes. There is little coffee along the trail, at Suyoc and Mancayan, all rusty.

"November 1. Cervantes to Sagada. There is some coffee at Cayan, Tadian and Bagnen, nowhere a great deal, and none of it free from Hemileia. The secretary at Cayan says there was once much more coffee there; that the industry became less profitable and declined because of late years crops are borne only in alternate years.

"Nov. 2. "Carefully inspected his coffee with Mr. Masferre. His plantation at Batilao once included nearly 20000 trees, but has now only about 5000. Another

Spaniard has about as many, but no longer resides there. Mr. Masferre is the best student of his coffee I have met. He distinguishes several diff rent strains of coffee in his plantation, and has long selected the fruit of some of these as seed. Yet, curiously, he has permitted some very poor strains to survive, and as he has been unable to take any care as to the paternity of his plants his selection of seed from the best mother plants has been less effective than it should have been. Two strains have been selected by him, both of which impressed me as very superior. One of these is a heavy bearer, of yellow, rather than red fruit, of large size, and is said by Mr. Masferre to be distinctly superior in flavor to any of his other coffee. The other is relatively immune to the attack of Hemileia, and bears, in the best development so far reached, fully 60% of 1-seeded fruit. The value of this peculiarity can be appreciated from the fact that the higher market value of the single seeds has made it worth while to select them by hand from Brazilian coffee. Mr. Masferre has agreed to send me the entire crop of the best tree of each of these two strains this winter, perhaps 4 gantas in all, at 3 pesos a ganta.

"None of these strains of coffee is free from Hemileia, but they are not equally susceptible. Mr. Masferre was of the opinion that a disease of the roots was also doing his trees much damage; but we could find none of it, and the search made me believe he was mistaken. In his opinion, the scarcity of cheap and reliable labor does greater mischief to the coffee industry than do all diseases.

"From Batilao I went into Bontoc, where I remained one night. There is little coffee in Bontoc, all infested by Hemileia, but without other evident disease.

"November 3, I returned to Sagada, Nov. 4, to Cervantes, and November 5, walked to Balili, where the plantation of Mr. Kane and his partners, formerly owned by Mr. Mills, includes about 100000 trees.

"Nov. 6, Mr. Kane came up from Cervantes, and we examined his coffee together. Baside Hemileia, which is more or less abundant on all his plants except young seedlings, his coffee also bears a black superficial fungus, which I could identify in the field as Capnodium. I have not seen it before in the Philippines. It was probably imported with some young Citrus trees; and as it has already spread to some wild native shrubs it is not likely to be exterminated. It is not a parasite on the coffee, nourishing itself by the honey-dew on the leaves, and is practically harmless except as it intercepts light. Mr. Kane believes that it tends to protect the leaves it covers against infection by Hemileia. He has gotten rid of it, with the accompanying insects, by treatment with kerosene emulsion. He has also tried to fight Hemileia, with Bordeaux mixture, but in the absence of lime he substituted $CaCl_2$. No effect was observed; but a more liberal application might have been injurious, as $CaCl_2$ in small doses is fatal to green plants if it gets access to the living cells; the latter salt is also so soluble as to be promptly washed off by rain. The important constituent of real Bordeaux mixture is $Cu(ON)_2$, which is too insoluble to injure the leaves or to wash off readily. Before the Hemileia becomes prevalent another year, Mr. Kane expects to make wide use of Bordeaux mixture, properly prepared. Mr. Kane has some seedlings he calls "Arabian coffee," grown from seed furnished by the Insular Bureau of Agriculture. I believe it grew in Guatemala; about 4% germinated. The seedlings are beginning to show Hemileia spots.

"November 11 and 12, I returned to Dagupan. Midway between Pozorubio and Dagupan is a garden of perhaps a dozen coffee trees, almost without fruit, in which Hemileia seems to be just appearing.

"There is no part of the region visited

where Hemileia is not present, nor are there any trees immune against its attacks.

"No other disease is doing any evident and considerable damage.

"Hemileia is much less virulent here than it is in Cavite, and, I suppose, in Batangas; probably because the lower temperature is more unfavorable to its rapid growth and propagation than to the growth and fruiting of the coffee. It would therefore be a simpler matter to reduce the damage done by it to practical unimportance; but no curative or preventative measures are possible, except in spots, while the growers believe their coffee to be healthy already. The most promising of such measures is treatment with Bordeaux mixture, as described in my report on the Cavite coffee.

"There are individual differences in the susceptibility of trees to damage by Hemileia. By selecting seed from the relatively immune individuals, the degree of immunity can certainly be greatly increased."

COFFEE CROP OF BENGUET BY TOWNS.

	1904	1905	
Adouay	15	27	cavans
Atok	12	85	
Baguio	6	12	
Bulakbak	2.5	15	
Bokod	49	101	
Buguias	71	107.5	
Cabayan	278	829	
Capangan	17	24	
Disdis	18	20	
Daklan	159	99	
Itogon	25.5	20	
Kibungan	3	5	
Kayapa	8	6	
Palina	6	15	
Trinidad	20	42	
Tublay	30	40	

CULTIVATION OF COFFEE IN THE VICINITY OF INDANG.

"In the neighborhoods of Indang and Mendez no coffee at all is now raised for sale, nor, so far as I have been able to learn, is there an acre of land now devoted to the cultivation of this plant. In the region tributary to Alfonso, three men, Angeles, Aviñante, and Varias, have still something like twenty acres each devoted primarily to coffee, which, as they understand cultivation, they cultivate. These remnants of plantations are not unmixed with abaca. Some other very small patches survive in this mixed condition, and scattered trees along roads or fences, or scattered through the brush, are witnesses of the importance coffee-growing reached here at its height. A little new coffee is being planted; but abaca has superseded it as the chief resource of the region.

"The methods of culture are most primitive. The plants used as seedlings are from self sown seed, obtained under old trees, without the slightest care as to their parentage. Without much care as to their age the young plants are transplanted from where the seeds germinated to the place where they are to grow. At this time, the ground is cleaned, and they are usually set out in rows. Subsequent cultivation is never more than mere cleaning. Even allowing for damage done by the typhoon, I could not fairly judge the thoroughness of this cleaning at this time, as the people have but recently been released from the reconcentration camps. The tree used for shading was formerly Gliricidia maculata (madre-cacao), or Erythrina (dapdap). About twenty years ago, the spineless form of dapdap, which probably originated in cultivation in Java, was introduced, and is now in almost exclusive use. The shade tree should also be an efficient wind-break, and this spineless dapdap, reproduced vegetatively very many generations, is unserviceable in this respect; but its decaying branches are regarded as especially valuable in improving the soil. Its superiority to the ordinary dapdap is in the absence of spines, and still more in its holding its leaves through December.

Except by the use of Erythrina, no attempt was ever made to fertilize the ground. Nor could I learn that anyone ever took the least care to prevent or cure any disease.

"Both from the statements of the leading citizens, who are quite unanimous on this point, and from my own observations, I am satisfied that there is and has been but one single serious disease of coffee in this region, that caused by the rust, Hemileia vastatrix. No disease of the stem or roots causes any considerable damage; and the men with local experience maintain that such enemies as they believe occasionally attack stems or roots only do so after the plant is already a victim of the rust. I have found the roots of even approximately healthy trees always sound. I have found one trunk chambered by termites, but hardly can imagine them to be a normal parasite in it. On dead stems; and on leaves suffering from Hemileia, I have found a number of other fungi, all of which can safely be regarded as innocuous.

"Hemileia vastatrix appeared in the coffee of Ceylon in 1868. All my informants agree that it appeared in Cavite in 1888, and gradually overcame the coffee during the succeeding decade. It is now to be found everywhere that its host survives, There is no remnant of a plantation without it; and I doubt there being even a single isolated tree. Young plants obtained in the local way are almost certainly infected from the start; but would stand no chance of escaping subsequent infection, in any case. The appearance and progress of the disease are so familiar to all interested that they need not be described here. The local opinion that it does not attack young trees is contrary to experience elsewhere.

"While the fight against Hemileia offers some difficulties not common to most conflicts with fungus enemies of cultivated plants, it is like all others in that methods well understood can save the host. It is not to be expected that the fungus will be exterminated; but it can be repressed, and the coffee be permitted to bear good crops, without expense enough to consume the profits. As the first step, the sources of infection should be removed as completely as possible. The scattered remnants of orchards, and the wayside trees are valueless, but will be very dangerous to possibly productive trees in their neighborhood. They should be cut and burned, with care that none escape. Every tree not worth the best treatment should be destroyed; it is as much a menace to sound coffee tree as a plague victim is to a healthy man.

"In the plantations the worst infected trees would best be destroyed. And all debris should be very carefully collected and burned; especial attention should be given leaves killed by the rust. With these sanitary measures, but not without them, it will be worth the work and expense to attempt to save trees still fairly vigorous from ever becoming badly attacked.

"It is generally agreed that the best means of combatting the attack of Hemileia, like that of many other fungi, is the use of copper. Since the salts of copper useful in sterilizing seeds or other structures when renewed infection is not feared are readily soluble, they can not be used to give leaves any prolonged protection, nor is the leaf itself immune against injury by them. The hydrate of copper, however, is almost insoluble; which prevents its being promptly washed from leaves by rain, and makes it practically harmless to the leaf. When dry it would be harmless to the fungus as well; but the fungus spore can germinate only when moist enough to permit the copper to kill it. This substance is probably best applied in the form of "Bordeaux mixture". The preparation should contain about 2% of copper sulphate, and enough fresh lime to make it neutral when used; this will usually be less than 2%, but depends upon the freshness

of the lime. The mixture should be used fresh. It may be applied by spraying, or by momentary immersion if the size of the plant permits. All trees should be thoroughly treated with it soon after the rains begin, say at the beginning of July, before the fungus begins to make its annual appearance. The application should be repeated whenever the fungus appears: unless there is infection from untreated trees, this can hardly be more than twice in a year.

"Experimentation on coffee at the school in Indang is recommended without qualification. In spite of the present turning toward abacá, coffee is the favorite crop of the inhabitants of that region, and no other work at the farm will enlist their interest and support so certainly as a study of this plant. At its best, it is a more valuable crop than abacá ever becomes, and its value is less depreciated by the difficulty of transportation.

"There are now a few young coffee plants on these grounds, set out by Mr. Workman. They had the locally usual origin, and are infected by Hemileia. The spread of the disease should be immediately arrested. In future, all trees should be from seed, carefully selected from trees conspicuous for productiveness or for immunity against disease; and the seed should be sown in seed-beds or pots, and transplanted to their permanent places at the beginning of the rains preferably at an age of about 10 months. If seed-beds are used, the ground should be thoroughly pulverized to a depth of 30 cm., and the seed sown in drills 2 cm. deep and 15 cm. apart, the seed at intervals of 10 cm. Weak or backward individuals should be eliminated.

"Important subjects of experimentation will be the value of fertilization and of cultivation, depth of shade that is most advantageous, and the best means of applying fungicides under local conditions.

Besides this work on Coffea arabica, I also recommend the introduction of Coffea liberica, for which seed should be obtained from Java or Sumatra. Trees of this plant should be planted at Indang at intervals of 4.5 m.; it will probably need no shading."

Fertilizers and the Growth of Rice

José Zamora

As a preliminary experiment, to furnish data for the intelligent planning of field experiments on the application of fertilizers to rice, a set of pot cultures was started in March, 1911. Twenty-one earthen pots were thoroughly cleaned and dried. They were then soaked on the outside with coconut oil, to prevent evaporation from the pots themselves, and consequent gradual removal of salt from the soil.

900 g. of a mixture of two parts loam and one part sand was put into each pot. Rice seed of an upland variety was germinated between filter papers. Feb. 20, two days after germination, chosen uniform seedlings were transplanted one to each pot. The fertilizers were applied at the same time.

Chemically pure salts were used in these experiments, the preparations being made in the chemical laboratory. Molecular solutions of the various salts were made up; from these solutions such quantities were measured with a burette as contained the weight of pure salt stated below in grams. These amounts are based on the assumption that rice is planted 25 cm. apart in each direction, or 160,000 plants to the hectare, and that a hectare is fertilized, in the case of pot I, with 214.4 kg. of ammonium nitrate, and 92.48 kg. of potassium phosphate. The other fertilizers are modifi-

cations of that used on this pot, with the same relation to amount per hectare, and need no further explanation.

Nineteen pots were fertilized, of which one was destroyed early in the experiment. Two check pots, unfertilized, were kept with these throughout. For a part of the time a number of other pots were kept as checks, and the growth of all these was notably uniform. Throughout the experiment, daily measurements were made of the growth of each leaf of each plant. The keeping of such complete growth records made it impossible to use such a number of plants as would of course be needed to get results of high reliability regarding the relation of the fertilizers to the yield. The preparation of these complete growth reports, showing the differences in the development of the rice under the influence of the different fertilizers, the constant effect of the treatment, was the primary object in making this study. But the necessity of transferring this work to Manila, involving the necessity of growing the plants under somewhat abnormal conditions, makes it appear now hardly worth while to publish the results at such length as to include these measurements. The growth tables would more than fill an issue of this magazine. In spite of the inadequate illumination of the plants, the experiment is not without value. Its results are shown in summary in the table on this page.

From the data given in this table, the following conclusions can be drawn:

First: The control plants, that is, those without any fertilizer, are far behind any of the fertilized plants, both in the rate of growth and in the number of grains set.

Second: The addition of salts of magnesium had no appreciable beneficial effect in any case. Pots XIII and XVIII, which received the most magnesium, bore the most backward of any of the fertilized plants. Pot XII, which received the smallest dose of magnesium, gave the best

Plant Salts	I.	II	III	IV	V	VI	VII	VIII	X	XI	XII	XIII	XIV	XV	XVI	XVII	XVIII	XIX	XX	XXI
NH_4NO_3	1.34	1.34	1.34	1.34	1.34	.134	1.34	0.67	0.67	2.68	1.34	2.68	1.34	1.34	0.67	2.68	2.68	1.34		
K_2HPO_4	0.578	0.578	0.578	0.578	0.578	0.578	0.578	0.289	0.289	1.156	1.578	1.156	0.578	0.578	0.289	1.156	1.156	0.578		
$CaH_4(PO_4)_2$		1.103	1.103	1.103	1.103	1.1031	1.103		0.5518	2.206	0.5518	2.206	0.578	0.289	1.44		2.206	0.289		
$MgCl_2$			0.8506																	
$Mg(NO_3)_2$				0.8506																
$MgSO_4$					0.8506		0.8506				0.4253	1.7012					1.7012			
No. of leaves	12	13	13	13	14	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
Height in mm	721	1140	771	851	830	893	943	860	870	688	952	535	833	1384	807	808	560	1012	481	503
Flowering, date	Jl.6	Jn.30	Jn.21	Jn.26	Jn.16	Jn.30	Jn.12	Jn.26	Jn.30	Jl.3	Jn.21	Jl.2	Jn.28	Jn.26	Jl.3	Jn.30	Jn.21	Jn.29	Jl.10	Jl.6
Grains, number	61	75	68	67	73	68	71	60	56	79	48	61	83	39	66	49	79	32	36	

results of any of the pots which received any.

Third: Of the three plants which were fertilized with ammonium nitrate and potassium phosphate only, that which received least and that which received four times as much throve about equally well.

Fourth: The most thrifty plants were those in pots XV and XIX. The next thriftiest is No. II, which differs from XB and XIX only in receiving a much heavier dose of calcium phosphate.

Fifth: The most promising fertilizer for rice on this land, calculated as per hectare is:—

NH_4NO_3	=214.40 Kg.
$KH_2(PO_4)_2$	=91.84 "
$CaH_4(PO_4)$	=46.24 "

WEATHER OBSERVATIONS FOR OCTOBER

Date	Rainfall		Temperature			
			On Hill		Temporary Building	
	In.	Mm.	Maximum	Minimum	Maximum	Minimum
1			32.3	24.8		
2			31.2	23.1		
3	0.05	1.270	31.7	23.4		
4			32.1	23.9	31.0	
5			32.0	23.8	30.3	24.4
6			31.8	23.3	31.1	23.9
7	0.31	7.874	30.9	22.9	30.0	23.7
8			31.1	22.9	30.4	22.9
9			30.1	23.2	29.7	23.7
10	0.02	0.508	29.0	24.7	28.9	24.9
11			30.7	23.8	30.2	23.9
12			30.4	23.3	30.8	23.9
13	0.32	8.128	29.7	23.7	28.1	24.4
14			31.3	23.4	30.4	23.4
15			28.9	23.3	28.7	24.0
16	0.20	5.08	28.6	23.3	28.1	23.9
17			30.1	23.2	30.0	23.4
18	0.01	0.254	28.0	23.0	27.0	23.5
19	0.15	3.81	28.2	23.7	28.0	23.4
20	0.01	0.254	28.8	23.0	28.4	23.0
21	0.10	2.54	27.5	23.5	27.0	23.5
22			28.5	23.0	28.0	23.0
23	0.01	0.254	27.0	23.2		23.0
24	0.02	0.508	31.6	21.8		22.7
25	0.08	2.032	29.3	22.9		23.7
26			29.6	21.6	28.5	22.3
27			29.6	21.9	29.6	23.0
28			29.6	21.1	29.0	22.7
29			29.0	23.5		23.0
30			30.0	24.4		24.5
31			29.2	23.4	29.4	24.5
Total	1.28	32.512				

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Organ of the Student Body of the Philippine College of Agriculture, Published Monthly During the School-year

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COURSE IN FORESTRY

The Academic Council and the Board of Regents of the University have authorized the establishment in the College of Agriculture of a course of study leading to the degree of Bachelor of Science in Forestry. The standard of admission to this course is graduation from the Public High Schools. The course may be completed by a four year course in residence at the college, or two years of field service as ranger in the Bureau of Forestry, under the direction of the Senior Forester stationed at the College, may be substituted for one year in residence. A full description of this course will be found in the catalogue of the University which is now in press.

The Bureau of Forestry has a record of which its director is justly proud. Nevertheless, its achievements in the past are by no means what ought to be accomplished in the future. The Philippines have tremendous untouched forest resources which are going to waste while necessary lumber and firewood are costing the Filipino people unreasonable prices. There are vast areas of land which are worse than non-productive because they make the forest inaccessible and constitute in various ways a menace to agriculture. To remedy these conditions is the natural work of the Bureau of Forestry. This work it can not perform, except in the fragmentary way in which it is now being done, with the funds which have been and are appropriated for its use.

If the Bureau of Forestry were adequately equipped with sufficient funds and a greatly augmented personnel, it could:—

First: Increase the value of the natural forest production from 5,000,000 pesos to 60,000,000 pesos.

Second: Cheapen the prices of timber and firewood to every inhabitant of the islands.

Third: Property protect forests which are essential to agriculture because of their effect on rainfall and streamflow.

Fourth: Develop a forest industry that will give profitable employment to thousands of the Filipino people.

Fifth: Reclaim lands now waste and eventually make them productive.

Sixth: Reduce or do away with the locust plague by replacing cogon areas with forests.

In the future the force of trained men to carry on this work must be furnished very largely by this college. The first need is for competent rangers. The first

class of trained rangers, seventeen in number, will be graduated in March. In the following years there will be annual graduating classes of at least thirty. It is very desirable for the sake of the very important work which the Bureau of Forestry is called upon to perform that the standard of natural ability among the young men of these classes should be the highest possible.

As an inducement to the most capable boys in the high schools of the Philippines, or graduating from these high schools, to take up this service, the Bureau of Forestry has stationed at Los Baños, as the faculty of the Department of Forestry, one of the strongest groups of trained specialists and tried teachers who are to be found in any forest school in the world. It is certainly safe to say that there is no other place where students who have finished two years of high school work can secure as expert instruction as is offered here. While the chief inducement to students to enter this course must be the work itself, and the high quality of the instruction, there are still other inducements offered. Pensions of twenty-five pesos a month and transportation are offered to thirty-five entering students annually. These boys are given free lodging and supplied gratis with a large part of the books and materials needed in their classes. They are given good board in a common mess hall at a cost of about ten pesos a month, and they are guaranteed employment by the government upon the completion of the course.

As the force of rangers increases, the present need of men in higher positions in the forestry service will at once become acute. It is to meet this need that more advanced instruction in this subject is now offered. The opportunity to carry the study of forestry beyond the preparation for service as rangers, and so to fit themselves directly for higher positions in the Bureau of Forestry should be a strong incentive to the most capable of the high school graduates to enter this course.—E. B. C.

Current Literature

DISEASES OF PEANUTS

Of the minor crops now in cultivation in the Philippines, peanut may be said to be most profitable. It is food for man, feed for beasts and fertilizer for the soil. The profit from it depends on the production, which is largely influenced by diseases.

Three fungus diseases have been observed on the plant in the West Indies by Mr. F. W. South whose notes on them have been published in the "West Indian Bulletin," Vol. X, No. 3, from which the following is an extract:

"Two fungi attack the leaves. They are Uredo Arachidis Lagh, and Cercospora personata Ellis. One attacks the roots and surfaces of the nuts, and is unidentified. Uredo Arachidis is a disease of local varieties of peanuts in the West Indies, and has been found to be more destructive to imported varieties. The fungus forms minute yellow postules or sori crowded or scattered under the leaves. The disease can be diagnosed as follows: 'Sori small, scattered on the under side surrounded by ruptured epidermis, brown; uredospore ovoid-round, minutely echinulate, 24-30 micron diam.; epispore yellow.' Mr. Robson, the curator of the Botanic station at Monserat, believes that the effect of the fungus on the leaves shortens the life of the plant, and causes a shrinkage in the production. Experiences in Dominica, however, showed that the production of nuts by healthy and unhealthy plants was not appreciably affected by the fungus. Spray-

ing with Bordeaux mixture has been effective in controlling the fungus in Monserat. On the treatment of ground nuts with a mixture of powdered lime and flowers of sulphur in Dominica, notes by Mr. A. J. Brooks state that 'A light dressing of the mixture is dusted on to the upper surface of the leaves from muslin bags. This is done just before sunset. At sunset, the leaves fold up and, by so doing, prevent the removal of the fungicide by wind. At the same time the under surface of the leaves is exposed. Another dressing is given an hour after sunset when the under surfaces of the leaves are treated. The light film of dew which will have fallen during the hour which has elapsed assists the mixture to adhere."

Cercospora personata.—This fungus is not serious in its nature. It is found in United States, and forms circular spots on the under surface of the leaves. The spots are 2.4 mm. in diameter, and are brown or olive green in color. The vigor of the attack of this disease seems to be favored by excessive moisture.

Bordeaux mixture and lime sulphur mixture are not very effective in controlling this fungus. For treatment, an ammoniacal solution of copper carbonate is recommended. Good drainage is said to assist in controlling the disease.

Root Disease.—This disease is unidentified, of wide distribution and its host plants (egg plants, tomatoes, alfalfa, some compositae, etc.) are numerous. The fungus seems to be a general root parasite. It attacks the roots, and kills them. It, then, spreads to the base of the stems. The plants attacked wilt rapidly and completely die in two days after the first wilting of the leaves. The mycelium spreads over the surface of the pods and causes the latter to shrink. This shrinkage causes a loss of some 40% of the crop. The fungus does not seem to penetrate the interior of the pods; for diseased nuts when disinfected with corrosive sublimate solution have been observed to produce healthy plants.

As described by Mr. South, "The causative fungus has a mycelium, which in its young condition forms a cob-web-like covering over the diseased portions. The hyphae are colorless and provided with occasional clump connexions. As they grow older they tend to form narrow yellow to brown filaments which arise in a characteristic way. The original hypha gives off lateral branches two or more at the same point. These branches run along parallel, and closely appressed to the original hyphae. They may in turn give off branches arising at the same point, this being usually also near the point of origin of the primary branch. The branching is somewhat similar to the characteristics of Rhodophyceae. In this way, a filament is formed. Occasionally the place of one of the branches, arising at any given point, is occupied by a prominent clamp connexion. The brown color of the older parts of the mycelium is due to some deposit on the cell walls, but the yellow color is caused by the presence of numerous small rod-shaped yellow crystals on the outside of the hyphae. The fungus does not appear to form fructifications easily as none have so far been found. Numerous small brown sclerotia about 1 mm. in diameter and approximately spherical in shape are, however, of frequent occurrence. These arise as minute tufts of colorless hyphae, which become compact and smooth externally, turning yellow and finally brown, as they do so. In section, they show an outer covering of brown cells two or three cells deep, and an inner colorless mass of loosely woven pseudoparenchyma. Taken altogether, the appearance of the fungus is very characteristic."

To help in controlling the fungus, it is advisable to dress the land infected with lime and to allow it to lie fallow for several months. Trenching the disease area is an ef-

fective mean in checking the fungus. Drainage seems to have but little effect on the fungus. Infected nuts, when used for planting, should be immersed for five minutes in a solution of corrosive sublimate (1 part corrosive sublimate in 1,000 parts of water).

PRODUCTION OF PEANUT

Experiment on the production of four varieties of peanuts has been conducted in Dominica in 1910 and was also published in Vol. X, No. 3 of the "West Indian Bulletin." A plot of 4,400 sq. ft. was divided equally among them. Two seeds were sown in each hill at a depth of 2 inches. The hills were two feet apart in each direction. The nuts used were saved from the crop of 1909. They were all attacked by root fungus and were disinfected for five minutes without subsequent washing. One of the five plots was planted with nuts not disinfected. The yields were as follows:

Variety	Actual Yields in pounds		Estimated Yield per acre in pounds	
	Uncured	Cured	Uncured	Cured
Spanish (untreated)	19	15½	940½	767
Spanish (disinfected.)	27	22	1,336½	1,089
Tennessee Red.	29	24½	1,435	1,213
Dixie Giant.	118	73¾	5,841	3,523
Carolina Running.	108	76	5,346	3,762

THE EFFECT OF UNLEACHED WOOD ASHES ON THE PRODUCTION OF PEANUT

(From the same number "West Indian Bull.")

3,234 sq. ft. was divided into two sections, A and B. Section A was used as control and Section B received an application of 3,025 lbs. per acre (estimated). Virginia Running Variety was used as subject of the experiment.

The nuts were reaped four months after planting. Section A gave a yield of 4,182 lbs. of cured nuts per acre, and Section B 4,202 lbs. (estimated) giving an increase of 20 lbs. in favor of the plot treated with wood ashes. This increase is practically negligible.

COOPERATIVE EXPERIMENTS ON THE PRODUCTION OF PEANUT IN HAWAII

An extensive cooperative experiment on the production of peanut has been conducted in Hawaii in 1908, 1909 and 1910. The production of nuts was compiled from eight crops grown during various seasons covering three years under widely different cultural conditions. The yields of cured nuts in pounds per acre were:

Variety	Weight in lbs.
Spanish	1,728
Bunch Jumbo	1,881
Running Jumbo	2,077
Virginia Creeping	2,063
Bunch Virginia	2,249

In Ceylon it has been estimated that the yield of different varieties of peanuts varies from 1,000 to 4,000 lbs. per acre. 6,000 lbs. per acre is said to have been obtained there with high cultivation.

Some experiments have been undertaken in this college of Agriculture on the production of peanut. It has been found by estimate that the average yield per acre was 3665 pounds of cured nuts.

WORLD SUGAR NOTES

From "The Louisiana Sugar Planter."

Russia is gradually increasing her sugar best acreage. The area in cultivation in 1909 was 1,375,091 acres; in 1910, 1,650,167; and it has been reported to be 2,043,079 acres this year.

Belgium, according to a consular report, consumed 217,800,000 pounds of sugar. This amount is ten times greater than the amount consumed 70 years ago. The total consumption is 28.6 lb. per capita.

California's sugar beet crop has been estimated to run up to a million tons this year. Idaho reports a large increase with nearly 40,000 acres and Michigan has over 150,000 acres.

It has been reported that Queensland has 6,000 farmers enthusiastic in cane raising; it takes 50 mills to grind out the yield employing 20,000 laborers in the field and some 6,000 in the mills.

The Dai Nippon Sugar Company of Japan made a profit of 459,000 dollars gold for the first half of 1911.

Formosa is said to have seventeen mills that are equipped as well as any mills in the world. The machines used are from England, the United States and Germany.

Cuba has 175 mills in operation. Every acre is reported to produce 12 bags of sugar aggregating 3,900 pounds.

Spain is producing large quantities of both beet and cane sugar. The cane sugar is grown mostly in the southern provinces and beet sugar in the north. There are 83 refineries in Spain.

Norway imports all its sugar from Germany.

THE VELVET BEAN

This is a tropical plant requiring only eight months for full development of vine and seed. Aside from its limited use as human food, it is raised for many other purposes. As ornament, it is used to cover trellises to screen objectionable views. Like other legumes it is a soil improver and is efficient in eradicating weeds. Its nodules are large. The greater part of the fixed nitrogen, however, is found in the vine and seed.

Farmers' Bulletin No. 451, recently published by the U. S. Department of Agriculture, states that "An entire crop (of velvet bean) plowed under as a fertilizer has been found to add to each acre ammonia equivalent to that applied in 1900 lbs. of cotton seed meal containing 7.5 lbs. of ammonia. A ton of beans in the pod contains 54.8 lbs. of Nitrogen, 31.8 lbs. of potassium and 13.8 lbs. of phosphoric acid, having a fertilizing value of from ₱20.00 to ₱22.00." Analysis of velvet beans in North Dakota showed that the plant contained 2.57% nitrogen, being inferior to peas, which contain 3.6%. The two plants were grown under similar conditions.

Velvet beans and cow peas plowed under have been found at the Alabama Experiment Station almost to double the yield of a crop of Sorghum subsequently planted. Velvet beans and cow peas planted on good land gave equal yield, but on poor, deep, sandy land the velvet bean produced more.

There are two methods of planting velvet bean. One, by pods, and the other by seeds. When pods are used for planting they should before hand be soaked in water to soften their coating. Because of the generally poor stand from planting by pods, this method is not recommended. The yield of velvet beans can be improved by seed selection, so it is advised to plant well selected seed. At the Florida Experiment Station, selected seed produced 33.79 bushels of shelled beans per acre, while the yield from unselected ones was only 28.37 bushels.

In the farm of this College velvet beans gave very excellent results. The seed is sown 45 cm. apart in the rows, while these are 60 cm. apart. They may also be planted broadcast, but this is only recommended in the wet season. By planting in drills two feet apart the Alabama Experiment Station obtained a yield of 7.300 lbs of beans, while by broadcasting only 5.360 lbs. were produced.

Current Literature

THE JAVA SUGAR SEASON.

Mr. H. C. Prinsen Geerbigs, the European correspondent of the *Australian Sugar Journal*, gives the following notes on the 1911 sugar crop of Java (*A. S. J.*, June 6, 1912):

"In the year 1911, 185 sugar factories worked in the Island of Java. They cut 135,780 hectares or 335,591 acres of cane and planted for the 1912 crop 140,360 hectares or 346,910 acres, thus increasing their area by 3.4 *per cent.* As all the cane planted in one year is harvested and rooted out in the following year no cane is left to stand over so that all the area harvested in 1911 was planted in 1910, just as all the land planted in 1911 will be cut in 1912, without leaving a ratoon or stubble for the next crop.

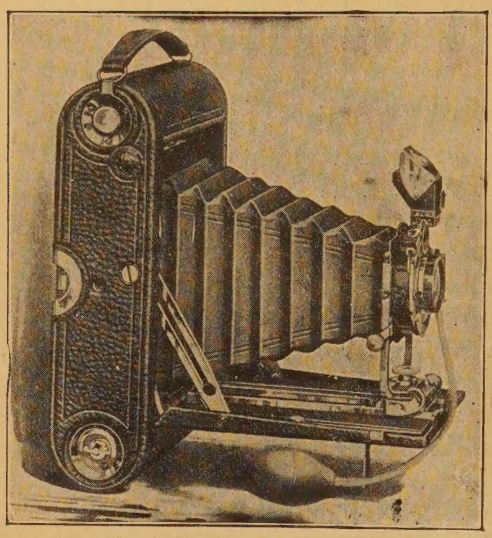
"..... It is sufficient to state here that scarcity of available land is the most important factor in this question so that the planters are compelled to get as much as they can from the little land they cultivate, while abundant and cheap labour enables them to plant afresh every year and to bestow the greatest care in regard to fertilization, the selection of plants, the combatting of pests and diseases and to tillage.

"The total crop amounted to 14,288,178 tons of cane, bringing the average tonage throughout the whole country to 42.3 tons per acre. The sugar extracted reached a total of 1,466,569 tons, or 10.26 per cent of the weight of cane or equivalent to 4.34 tons of sugar per acre.

"Out of the 185 factories in the country no less than 119 produced more than that average of 4.34 tons per acre and ten estates produced even over 5.20 tons.

"As to the quality of sugar in Java the writer states that 10 years raw sugar of 96 degrees polarization was exclusively exported from Java to the United States, China, Australia, and Great Britain, but in the year 1903 trial was made with a small shipment of white sugar made directly from the cane juice, without the use of bone black or refining." ..... "In the year 1911 no less than 35.2 per cent of the total output was white sugar for direct consumption; 33.6 per cent was crystallized sugar of a fairly good color, which is much sought after by refiners, while only 27 per cent was raw cane sugar, basis 96 polarization, as is the standard for importation into the United States and Japan. The balance consisted of after-products exported to Oriental ports for confectionery purposes, and to Europe as brewers' sugar, while, finally, a quantity of 59,221 tons of desiccated molasses was shipped to India to serve as raw material in distilleries."

On another part of the same number of the journal we find the following facts and figures concerning Java: "Java is only a small island of about 50,000 square miles. Its population is over 30,000,000 of whom about 81,000 are European. Amongst the latter, the Dutch, of course, predominate, and there are about 65,000 of them. About forty per cent of the soil of Java is under cultivation, the principal crops grown being: Rice, 5,800,000 acres; maize, arachis, cotton and various others, 5,600,000 acres; sugar cane, 340,000 acres; tobacco, 340,000 acres; and indigo, 31,000 acres. The areas given are in round numbers. In addition to the above mentioned tea, coffee, cinchona and cacao are also largely cultivated. Dutch rule began in the island in 1610, and now Java may be considered the center of the commerce and trade of the Dutch East Indies. The value of the exports is estimated at from £20,000,000 to £25,000,000 per year, of which sugar plays an important part, while the imports are about £16,000,000.



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